

## **Title: Which Sells Best?**

### **Link to Outcomes:**

- **Problem Solving** Students will solve the open-ended problem of determining which product sells best in a cooperative atmosphere.
- **Communication** Students will communicate the results of their research through circle graphs, a written presentation, and an oral presentation.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect mathematics to business and economics.
- **Estimation** Students will demonstrate their ability to apply estimation strategies in computation with the use of technology and in problem solving. They will determine reasonableness of solutions.
- **Geometry** Students will demonstrate their ability to apply geometric relationships in the construction of a circle graph.
- **Measurement** Students will demonstrate and apply concepts of measurement by selecting the appropriate unit of measurement and the tools used in the construction of a circle graph.
- **Statistics** Students will demonstrate their ability to collect, organize, and display data and will interpret information obtained from displays. They will write a proposal based on statistical information.
- **Probability** Students will use a simulation to demonstrate the basic concepts of probability as applied to predicting a real-life situation.
- **Arithmetic Operations** Students will demonstrate their ability to solve problems using arithmetic operations with technology. They will choose appropriate operations and describe effects of operations on numbers.
- **Number Relationships** Students will demonstrate their ability to describe and apply number relationships using concrete and abstract materials. They will choose appropriate operations and describe effects of operations on numbers.
- **Patterns/ Relationships** Students will demonstrate their ability to recognize numeric and geometric relationships and will generalize a relation from data through the use of a circle graph.

### **Brief Overview:**

The students are asked to solve a business problem using probability and statistics. Cooperative groups will use previously taught mathematics skills to analyze and present the data they have collected. Each group will prepare a written proposal, including visual aids, to be presented orally.

**Grade/Level:**

Grades 6-8

**Duration/Length:**

The lesson will be four class periods, not necessarily consecutive.

**Prerequisite Knowledge:**

Students should have a working knowledge of the following skills:

- Understanding and applying appropriate vocabulary
- Collecting data
- Organizing data
- Constructing circle graphs using protractor, compass and straight edge
- Manipulating fractions, percents and decimals
- Determining and applying basic probability to problem solving

**Objectives:**

Students will:

- choose an appropriate sample for a given population.
- construct a survey.
- gather and interpret data.
- present data in a circle graph.
- write a recommendation in the form of a proposal.
- present the proposal orally using the supporting graphics.

**Materials/Resources/Printed Materials:**

- 2 printed worksheets : Proposal, Constructing a Circle Graph
- calculators
- word processor (optional)
- compasses, protractors and straight edges
- colored markers or pencils
- pencils and pens
- poster board
- paper

**Development/Procedures:****Day 1: THE PROPOSAL**

Present the problem to the students (Distribute Proposal worksheet).

Lead the class in a discussion of collecting data from an appropriate sample of the student population. (\*\* See Teacher Resource Sheet \*\*) Students should be broken into cooperative groups. Each group should be given a copy of the proposal, paper, and pencils or pens. By the next class period, each group should have an instrument prepared to collect the data from the sample it has selected.

## **Day 2: DATA ANALYSIS**

(Time will have been allotted for data collection)

Analyze the collected data and begin to construct circle graphs using the Constructing a Circle Graph worksheet. (\*\* see Teacher Resource Sheet \*\*)

## **Day 3: PREPARING THE PRESENTATION**

Draft the proposal on the word processor.

Construct the supporting visual aids.

## **Day 4: ORAL AND VISUAL PRESENTATION**

Present the proposal orally using visual aids and submit the written proposal.

### **Evaluation:**

By circulating around the room, the teacher observes the level of group participation and performance based on the validity of the sample choice and the instrument being created to collect data. On the Constructing a Circle Graph worksheet used on Day 2, the teacher will evaluate the accuracy of the computation used in the data analysis and its application to the construction of the circle graph. The written recommendation is graded by how well it adheres to current writing standards and how well it is supported by the data. The oral presentation will be judged on member participation, clarity, and persuasiveness based on the data as seen in the visual aids.

### **Extension/Follow Up:**

Possible extensions include the following:

- The student government receives an increased allowance. Determine if two or more items should be sold.
- Determine which item(s) would generate the highest profit.
- Determine if there are other items which students would prefer to buy.
- Predict the profit for an item sold at an after school sports event or some other event outside of school.

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Proposal

Name

Group

**The student government has asked our math class to research a problem so that they can make a decision regarding a fund-raising sale of snacks. They have limited space and funds, so they will only be able to sell one item. You have been asked to determine which product the student government should sell. The three items that the student government is considering are sodas, chips, and ice cream. The estimated profit per item is the same for all three items. Your group will submit a written proposal which will include a written recommendation, all worksheets and visual aids. Your group will have 3 minutes to present a recommendation based on your findings. Be sure to include visual aids in your presentation.**

How will you choose the people in your sample?

How many people will be in your sample?

What are your survey questions?

How will you record your data?

Do your results make sense?

(The next time you meet in your group you will need to have completed your data collection.)

## Constructing a Circle Graph

Name \_\_\_\_\_

Group \_\_\_\_\_

There are \_\_\_\_\_ (how many) questions on the survey.

There were \_\_\_\_\_ (how many) people surveyed.

Sort the different responses into categories or groups. There are \_\_\_\_\_ (how many) categories or groups. This is the number of sectors which will be in the circle graph.

Draw a sector for each category

- Choose one category. There are \_\_\_\_\_ (how many) responses in this category. What fraction is this of the whole sample? \_\_\_\_\_ Write this as a decimal. \_\_\_\_\_ Write this as a percent. \_\_\_\_\_
- Determine the number of degrees (n) in the circle graph representing the category above:

$$\frac{n}{360^\circ} = \frac{\text{number of responses}}{\text{number surveyed}} = \underline{\hspace{2cm}}$$

(Reminder: Every circle has a total of  $360^\circ$ )

$$n = \underline{\hspace{2cm}}^\circ$$

(Rounded to the nearest degree)

Construct a circle using a compass.

Use a straight edge to draw a radius from the center

- Use a protractor to measure the number of degrees (n) in the chosen category.
- Use a straight edge to draw a radius from the center to this point. This is one sector of the circle graph.
- Repeat the instructions above to draw the remaining sectors for each category in the circle graph. The entire circle graph will be filled only when every category has been represented.

## Teacher Resource Sheet

- Prior to Day 1 - PREPARATION FOR TASK  
Review prerequisite knowledge including the following terms:  
profit, proposal, recommendation, visual aids, presentation, sample, population, survey, construct, sector
- Day 1 - THE PROPOSAL  
Lead the class in a discussion of collecting data from an appropriate sample of the student population.

*Suppose I want to find out some information about this class and I don't want to have to talk to every student in the class to find my answer. What could I do? (Allow student responses. Guide students to the idea of a sample.) Suppose I choose these students as my sample. (Choose students who are located in the front row.) Of these students, how many of them are located near the front of the room? Can we now say that all of the students in this class are near the front of the room? Is this a good sample of the population? Why or why not? How can we find a good sample for this question?*

(The teacher will describe other examples to illustrate good and bad samples.)

- Day 2 - DATA ANALYSIS  
(Time will have been allotted for data collection)  
Analyze the collected data and begin to construct circle graphs using the Constructing a Circle Graph worksheet.

Suppose there were 2 questions on the survey. There were 50 people surveyed. The responses have been sorted into 3 categories. Of the 50 people surveyed, 10 liked fruit juice. This is the first category. What fraction is this of the whole sample? 10/50

Write this fraction as a decimal  $10/50 = .20$

Write this fraction as a percent  $10/50 = .20 = 20\%$

In order to find the sector (piece of pie) of the circle graph, use a proportion:

$$\frac{n}{360^\circ} = \frac{\text{number of responses}}{\text{number surveyed}} = \frac{10}{50} \quad n = 72^\circ$$

(Teacher needs to address rounding and rounding errors here.)

Construct a circle using a compass.

Use a straight edge to draw a radius from the center

- Use a protractor to measure the number of degrees (n) in the chosen category.
- Use a straight edge to draw a radius from the center to this point. This is one sector of the circle graph.
- Repeat the instructions above to draw the remaining sectors for each category in the circle graph. The circle graph will be filled only when every category has been represented.

## Evaluation Checklist

## Group

### **Participation and Performance**

- Every group member is actively participating.
- Group roles have been assigned.
- Jobs are completed according to role assignment.

**Yes**

**No**

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### **Validity**

- Chosen sample is representative of the population.
- Survey addresses all three items.
- Survey questions are relevant to the problem.

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### **Accuracy of Computation**

- Fractions are correct.
- Decimals are correct.
- Percents are correct.
- Number of degrees in each sector is correct and has been rounded correctly.
- Sectors are measured correctly.
- Sectors are labeled.

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### **Written Proposal**

- A recommendation is made.
- Recommendation is supported by data.
- Proposal meets writing standards.

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### **Oral Presentation**

- Group members participate in presentation according to assigned roles.
- Recommendation is clearly presented.
- Conclusion is supported by data.
- Visual aids are used.
- Visual aids are easy to read.

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